Efficiency Plus in Steel Production

By JOHN BURNHAM, ENGR. I

THE Geneva Steel Works, located at Geneva, Utah, is one of the largest steel plants west of the Mississippi. The steel made in nine open-hearth furnaces and rolled on the 3750-foot continuous plate mill is being used to supply the shipbuilding plants of the West Coast.

The plant, built at a cost of $180,000,000 for the Defense Plant Corporation, has a capacity of approximately 3300 tons of pig iron per day from its three blast furnaces. Coke is produced for the furnaces in more than 250 by-product coke ovens.

An urgent need was felt for a steel plant in the west, when, after December 7, a huge shipbuilding program was necessitated on the west coast. The steel for use on the coast had then to be shipped from distant mills in the eastern third of the United States, thus imposing a heavy load on the nation's transportation line. The railway systems were already overburdened with wartime traffic and the merchant marine, in constant danger from subs, also had to take into account the possibility of the Panama Canal being closed.

Such were the compelling reasons for the building, in less than two years, of the plant which covers 1600 acres and is capable of producing 1,280,000 tons of steel annually.

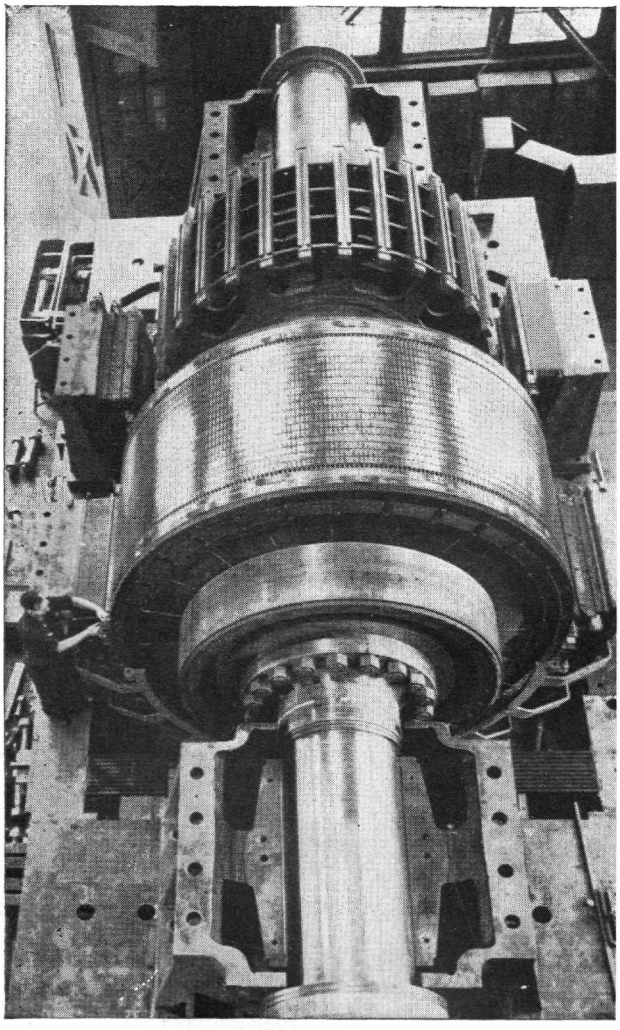
The plant is perhaps unique in that all of the raw materials needed in the manufacture of its steel are found within the state. Coal is supplied from the new Geneva Mine opened at Horse Canyon, approximately 130 miles southeast of the plant. Iron ore is furnished from an open pit mine at Iron Mountain, Iron County, Utah, about 255 miles south-west of the works. Limestone and dolomite are secured from two new quarries near Payson, Utah, 25 miles from the steel plant. Water is obtained from the adjacent Wasatch Mountains and from artesian wells and flowing springs on the plant site.

The plant includes four batteries of sixty-three by-product coke ovens each, three 1100-ton blast furnaces, nine 225-ton open-hearth furnaces, a 45-inch slabbing and blooming mill, a 132-inch continuous plate mill, a 26-inch structural mill, and complementary facilities. The estimated annual capacity of the Geneva Works is 1,150,000 net tons of iron, 1,280,000 net tons of steel ingots, and 900,000 net tons of rolled steel.

The Geneva Coal Mine is located in Book Cliffs, the strata of which are folded as the name suggests. Another mine is located in the same seam some seven miles away.

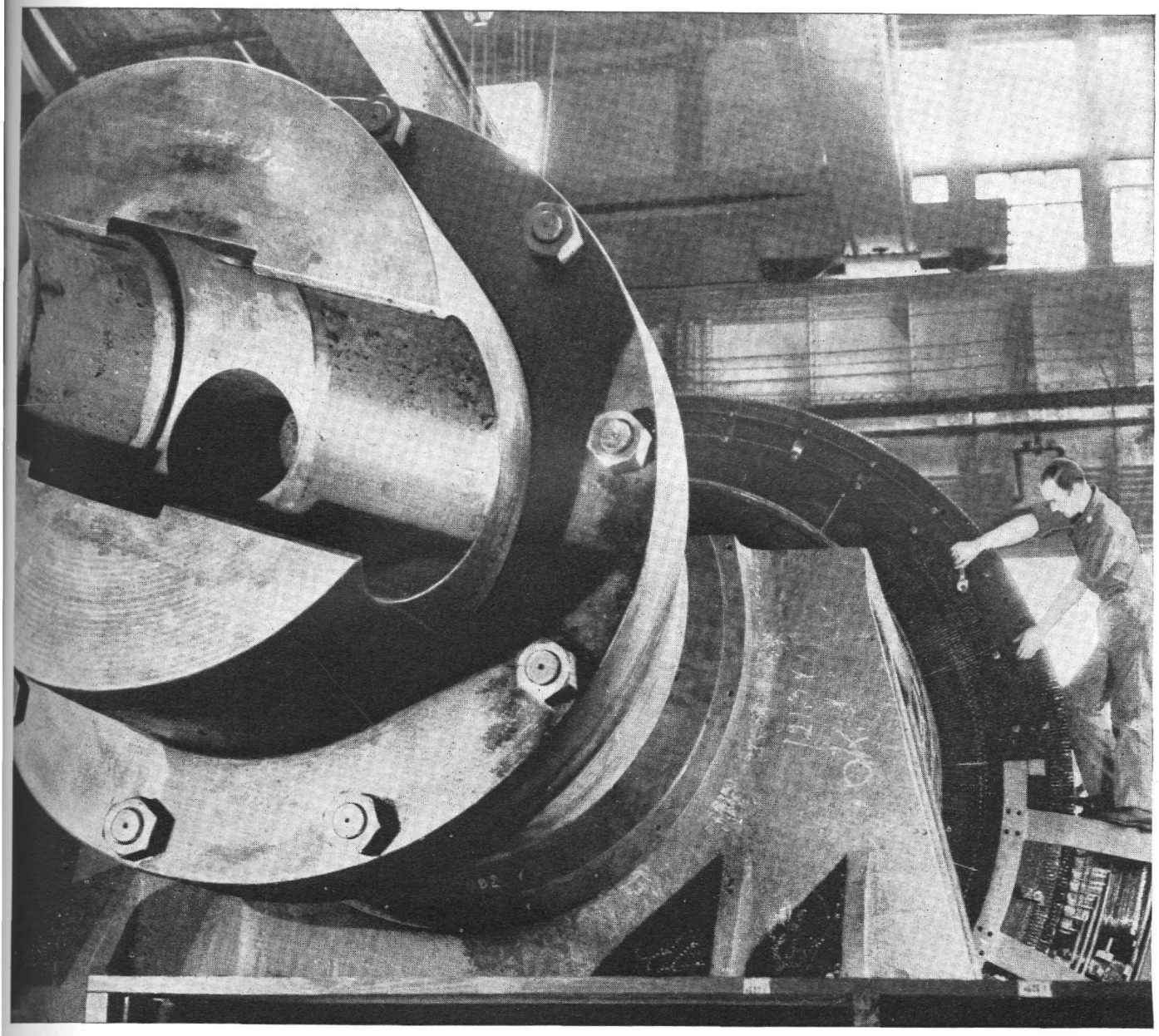
The outcrop of the mine seam in Book Cliff is 6535 feet above sea level. Varying from 10 to 16 feet in thickness, it has a downward pitch of 11 percent. Openings have been made into the seam on both sides of the canyon about a half mile from the mouth. On the north side the mine has been driven 3100 feet to the property line. The south mine is being driven into the cliff one and one-half to two miles.

The mines are modern in every detail and free from gas. No picks or shovels have been or are intended to be used. An elaborate system of loaders, shakers and conveyors is used, with the downward grade fully utilized. Finally, the coal is delivered by endless belt to the mouth of the canyon, where it is sorted and loaded by gravity onto railroad cars.



—Courtesy General Electric.

Most powerful motor in the world for the largest steel plant west of the Mississippi River



—*Courtesy General Electric.*

Giant coupling of the powerful electric motor of the Geneva Steel Mill being assembled in the factory. Rated at 7000 h.p. it is double-reversing and consists of two units in series

An interesting innovation is found in the cap house and powder house, where care must be taken against explosion. Instead of having electric or other lamps in these buildings, light is reflected into them through mirrors on the doors; sunlight in the daytime and artificial light at night.

The mines, located in Carbon County, are expected to produce 8000 tons daily by the end of the year, although only about 5000 tons are now being removed.

Water for the Geneva Works is obtained from the Deer Creek Reservoir, a Federal Reclamation project on the Provo River, and is purchased on lease from the Metropolitan Water District of Salt Lake City. The water from this source is supplemented by water from artesian wells and springs located on the plant property.

All water that can be reclaimed in the plant is returned to the reservoir where it is permitted to cool for re-use in plant operations. Hence the only water loss is through evaporation or contamination. When the reservoir is filled, all the water is treated to remove hardness, and all "make-up water" introduced is similarly treated. Thus all water that passes through the reservoirs is freed from scale-forming salts.

Nearly 220,000,000 gallons of water are pumped through the plant daily, while actual consump-

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tion is only 9,000,000 gallons of critical water and 20,000,000 gallons of drainage and artesian well water.

The iron ore handling of the Geneva Works reflects local conditions of supply. Since the mines operate all year long, it is unnecessary for huge stock piles of ore to be built up. However, since the different ores are of different content and a uniform mixture must be fed to the furnaces, some system had to be devised for blending the ores.

This is accomplished by what is called a bedding system. Incoming cars of ore are discharged by an underground conveyor, which delivers to a series of parallel conveyors, each of which empties into a traveling ore stacker. The stacker distributes the ore at right angles to long parallel beds, spreading a layer the length of the bed. Then when more ore is needed in the blast furnaces, a traveling ore reclaimer slices crosswise of the beds, thus getting an average of the ores.

The ore bedding system has sufficient capacity to provide ore to operate the furnaces for about ten days in case of a stoppage of supply from the mine.

Air for the furnaces is supplied by four turboblowers, one to each furnace with one as a spare. The blowers, same as those at eastern plants except for change due to higher altitude and consequent lower atmospheric pressure, deliver approximately 95,000 cubic feet of free air per minute.

The nine open-hearth furnaces are designed to use a large proportion of molten iron to keep the scrap charge to a minimum. The furnaces are fired with a mixture of tar and coke oven gas and are equipped with waste heat boilers, which reclaim heat from furnace waste gases and produce steam to augment the power supply.

The ingot molds are supplied by the ingot mold foundry where they are cast either from molten metal taken directly from the blast furnaces or from pig iron remelted in cupolas.

Ingots poured in the open-hearth plant are transported to the mill where they are stripped, placed in soaking pits, and then carried by ingot delivery car to the slabbing mill entry.

At the slabbing mill, the slabs are squared and sheared, either to be sent immediately to the plate mill, or to be delivered to a storage and reheating pile. About one-third of the plates are direct-rolled, thus saving considerable time.

The 132-inch plate mill consists of three slab reheating furnaces of the continuous type, a scale breaking stand, a broadside stand, a revers-

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OWI Photo by Palmer, in an Allegheny Ludlum plant

Steel Man with a Mission

. . TO KEEP THE ELECTRIC FURNACES MELTING

ALL of us, men or women—on the job or off it—are people with a mission these days. The war makes common cause for every one and spares no one.

This maintenance man's job, atop an Allegheny Ludlum electric furnace, is no less essential than that of the crew who operate the furnace, nor than that of the men in the factories who use the stainless, tool, valve or electrical steel it produces. Total war requires maximum cooperation on the supply fronts as well as the fighting fronts, and it asks also that every last bit of manpower and materials be used to the maximum advantage.

Boiled down to a very few words that simply means: *no waste—everybody help.* It means, in terms of your everyday life, using everything wisely to secure the most wear; reducing expenditures to a minimum; saving materials; buying War Bonds and stamps to the limit.

It also points up a responsibility that falls upon you as one of the next generation of business men and technicians. War is the ultimate waster of men and materials, but it brings about enormous technical progress and development. That has been very true in the special steel fields. It will be yours to translate these advances into terms of better living.

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STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum
STEEL CORPORATION
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ing roughing mill, a secondary scale breaking stand, and four stands of continuous finishing mills. Plates leaving the finishing stand are conveyed by roller tables to hot beds, roller levelers, and end and side shearing equipment and plate pilers. From the pilers the plates are delivered by transfer car to the plate shipping department.

The rolling mills are served by a common roll shop equipped for dressing and turning all types of rolls.

The most powerful electric motor in the world is being used at the Geneva Works on the plate mill. The motor, rated at 7000 horsepower and with a shaft speed of only 25 revolutions per minute, will drive a reversing rougher. Operating on direct current, the motor weighs one million pounds, stands 13 feet above the floor level and has an over-all length of 44 feet.

Power for the plant is furnished by five boilers, rated at a total of 1,200,000 pounds of steam per hour, fired with blast furnace gas, coke oven gas, powdered coal, and coke breeze. The principal uses of the steam are to operate the turbines of the power plant, blowers, and for general plant process use.

The electric power is generated by one 5000 kilowatt turbo-generator, at 13,800 volts and 60 cycles. In event of failure of this single generator, electricity will be drawn from public utility sources.

The history of iron and steel production in Utah is longer than one might think. It was on September 30, 1852, that the first pig iron was produced at Cedar City, Utah, the first ever produced west of the Mississippi. It was the hope of Brigham Young, leader of the Mormons who first settled in the territory, that his state of Deseret might become self-sufficient, and to this end an exploring party was sent out which located iron ore deposits some 300 miles south of Sale Lake City.

After the furnace had been tapped at Cedar City it was purchased and enlarged by the Deseret Iron Company, which had raised $16,000 by selling stock to the Mormons in England, but the enterprise soon needed to be subsidized.

Despite the subsidy the works closed permanently in 1858. The next venture in iron production in the district was undertaken in 1868 by the Great Western Iron Manufacturing Co. at Ironton, about four miles southwest of Iron Mountain, where the ore mines were situated. In 1873 the furnace was blown in, with an output of 2400 pounds of pig iron every day, but the enterprise was not a financial success, and ceased operations in 1883.

Since 1924, a blast furnace blown at Provo, Utah, successfully used coke made from Utah coals in by-product coke ovens on the premises.

The location at Geneva provides for good coal, iron ore, and a sufficient water supply, each within a 300-mile radius of the plant. Such a set-up is rare. All our eastern works must haul one or the other of the raw materials for some distance. In addition to having raw materials close, the Utah plant is much nearer to the area it supplies than any other works, as the plates made here will go to help our war effort in building ships on the West-coast yards.
